1. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of $200°$ *C and is placed into a* $20°$ *C bath to cool. After 30 minutes, the uranium has cooled to* $139°$ *C.*

   A. $k = -0.01731$

   B. $k = -0.02572$

   C. $k = -0.02529$

   D. $k = -0.01379$

   E. None of the above

---

2. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100000	99965	99945	99930	99919	99910	99902	99896	99890

   A. Linear

   B. Non-Linear Power

   C. Exponential

   D. Logarithmic

   E. None of the above

---

3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 20° *C bath to cool. After 18 minutes, the uranium has cooled to* 91° *C.*

A. $k = -0.04036$

B. $k = -0.04155$

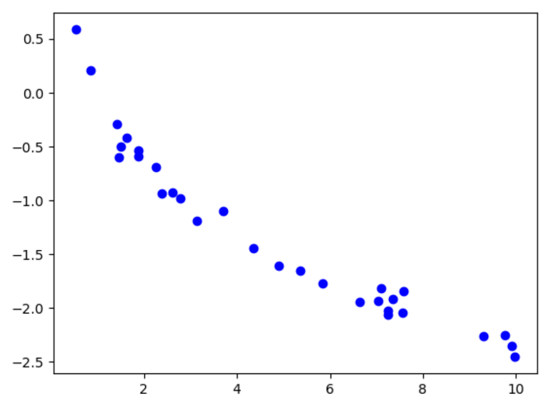
C. $k = -0.03360$

D. $k = -0.03940$

E. None of the above

---

4. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Logarithmic model

C. Linear model

D. Non-linear Power model

E. None of the above

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5. Using the scenario below, model the population of bacteria α in terms

of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 14 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 47 minutes

B. About 32 minutes

C. About 282 minutes

D. About 197 minutes

E. None of the above

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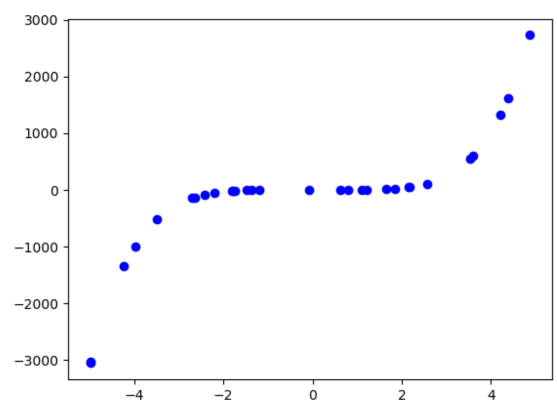
6. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Exponential model

D. Logarithmic model

E. None of the above

7. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 606 grams of element X and after 4 years there is 75 grams remaining.

A. About 365 days

B. About 365 days

C. About 1 day

D. About 1825 days

E. None of the above

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8. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 908 grams of element X and after 7 years there is 113 grams remaining.

A. About 1 day

B. About 1095 days

C. About 3285 days

D. About 730 days

E. None of the above

---

9. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 3 hours, the petri dish has 147 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 74 minutes

B. About 207 minutes

C. About 34 minutes

D. About 449 minutes

E. None of the above

---

10. A town has an initial population of 80000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	80080	80320	81280	85120	100480	161920	407680	1390720	532288

A. Linear

B. Logarithmic

C. Non-Linear Power

D. Exponential

E. None of the above

---

11. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 160° *C and is placed into a* 13° *C bath to cool. After 14 minutes, the uranium has cooled to* 102° *C.*

A. $k = -0.04190$

B. $k = -0.05277$

C. $k = -0.03584$

D. $k = -0.05352$

E. None of the above

---

12. A town has an initial population of 50000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	50030	50060	50090	50120	50150	50180	50210	50240	50270

A. Non-Linear Power

B. Exponential

C. Linear

D. Logarithmic

E. None of the above

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13. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 15° *C bath to cool. After 26 minutes, the uranium has cooled to* 87° *C.*

A. $k = -0.02418$

B. $k = -0.02823$

C. $k = -0.02737$

D. $k = -0.02785$

E. None of the above

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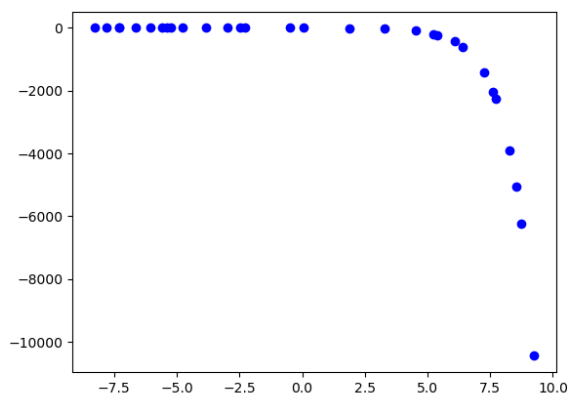
14. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Logarithmic model

C. Linear model

D. Non-linear Power model

E. None of the above

---

15. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 3 hours, the petri dish has 664 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 345 minutes

B. About 146 minutes

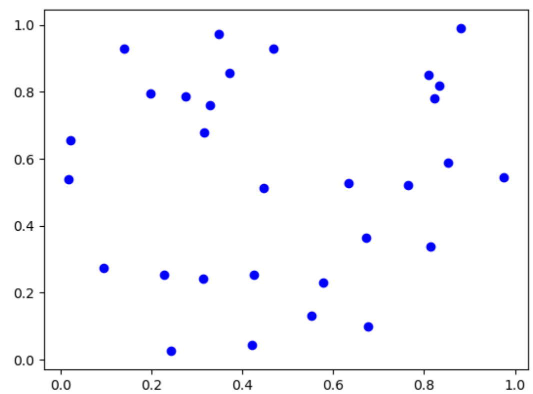
C. About 57 minutes

D. About 24 minutes

E. None of the above

---

16. Determine the appropriate model for the graph of points below.



A. Linear model

B. Logarithmic model

C. Exponential model

D. Non-linear Power model

E. None of the above

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17. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 759 grams of element X and after 6 years there is 75 grams remaining.

A. About 365 days

B. About 730 days

C. About 1 day

D. About 2920 days

E. None of the above

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18. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 848 grams of element X and after 3 years there is 212 grams remaining.

A. About 1095 days

B. About 1 day

C. About 365 days

D. About 730 days

E. None of the above

---

19. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 3 hours, the petri dish has 384 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 23 minutes

B. About 251 minutes

C. About 142 minutes

D. About 41 minutes

E. None of the above

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20. A town has an initial population of 50000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	49900	49800	49600	49200	48400	46800	43600	37200	24400

A. Non-Linear Power

B. Linear

C. Exponential

D. Logarithmic

E. None of the above

---

21. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 120° *C and is placed into a* 12° *C bath to cool. After 22 minutes, the uranium has cooled to* 61° *C.*

A. $k = -0.03592$

B. $k = -0.04071$

C. $k = -0.03113$

D. $k = -0.03057$

E. None of the above

---

22. A town has an initial population of 60000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	59964	59924	59884	59844	59804	59764	59724	59684	59644

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

E. None of the above

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23. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $180°$ *C and is placed into a* $11°$ *C bath to cool. After 14 minutes, the uranium has cooled to* $110°$ *C.*

A. $k = -0.09660$

B. $k = -0.04270$

C. $k = -0.05354$

D. $k = -0.05300$

E. None of the above

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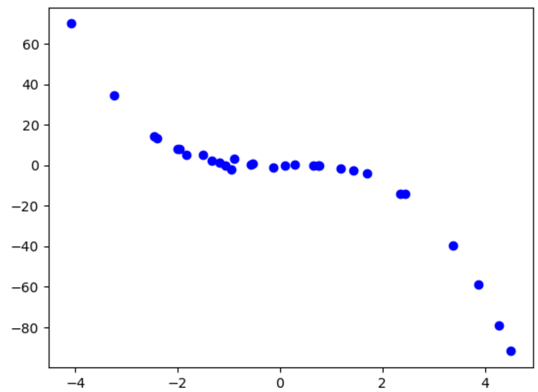
24. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

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25. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 2 hours, the petri dish has 704 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 25 minutes

B. About 14 minutes

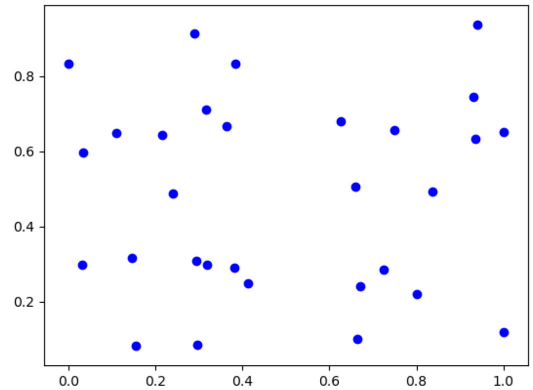
C. About 152 minutes

D. About 85 minutes

E. None of the above

---

26. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Logarithmic model

D. Exponential model

E. None of the above

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27. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 551 grams of element X and after 3 years there is 91 grams remaining.

A. About 1095 days

B. About 365 days

C. About 365 days

D. About 1 day

E. None of the above

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28. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 740 grams of element X and after 9 years there is 82 grams remaining.

A. About 1 day

B. About 4380 days

C. About 1460 days

D. About 730 days

E. None of the above

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29. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 877 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 285 minutes

B. About 131 minutes

C. About 21 minutes

D. About 47 minutes

E. None of the above

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30. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89940	89880	89760	89520	89040	88080	86160	82320	74640

A. Exponential

B. Linear

C. Non-Linear Power

D. Logarithmic

E. None of the above